REMARKS/ARGUMENTS

Claims 1-13, 15, 18, 21, 22 and 25-29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Chiang et al., U.S. Patent No. 6,428,859 in view of Sherman U.S. Patent No. 6,342,277, Chiang et al., U.S. Publication No. 2002/0197402 and Machida et al., U.S. Patent No. 4,732,761.

Claim 14 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Chiang et al., U.S. Patent No. 6,428,859 in view of Sherman, Chiang et al., U.S. Publication No. 2002/0197402 and Machida et al., U.S. Patent No. 4,732,761, as applied to claims 1-13, 15, 18, 21, 22 and 25-29 above, and further in view of Qian et al., U.S. Patent No. 5,571,576.

Claims 16, 17, 19, 20, 23 and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Chiang et al., U.S. Publication No. 2002/0197402, in view of Sherman, Chaing et al., and Machida et al., as applied to claims 1-13, 15, 18, 21, 22 and 25-29 above, and further in view of Grimbergen et al., U.S. Patent No. 6,406,924

Examiner Interview

Applicants thank the time the Examiner spent discussing this case by telephonic interview on June 21, 2007. During the interview, Applicants explained the differences between the prior art references and the inventions of independent claims 1, 2 and 15. Specifically, Applicants pointed out the following:

With respect to claim 1, the current Rejection states that because the bias and temperature conditions set forth in Chiang overlap Applicants ranges it was the Examiner's position that temperature would provide activation energy to drive the reaction in Chiang. Office Action, Response to Arguments section, pages 10-11. During the interview Applicants noted that temperature and bias power are only two of the variables associated with whether or not thermal energy or kinetic energy would be the primary activation energy for a reaction and that other variables include the type of material being deposited and the atomic mass of the constituents in the reaction.

Chiang uses relatively heavy ions (e.g., Ar, Kr, Ne and Xe) as part of its MII-ALD process in order to "deliver the energy needed to drive surface reactions" (col. 7, lines 6-

12) and states that its process "is ion-triggered, i.e., ion induced, as opposed to ion-assisted in that deposition will not generally occur without ion bombardment since ions are used as the primary means of providing the activation energy required for deposition" (col. 6, lines 3-8 (emphasis added). Chiang further specifically states that it's reaction "utilizes kinetic energy transfer rather than thermal energy" and that temperature is a "secondary control variable". See col. 6, lines 60-64 (emphasis added). Thus Chiang is in direct contrast to the invention of claim 1 which uses "primarily thermal energy to provide activation energy to drive the deposition reaction" and a person of skill in the art would appreciate that even if a subset of temperature and bias power ranges overlap between Chiang and the present application these parameters alone do not determine whether a particular reaction will be primarily driven by thermal or kinetic energy and in view of the entire disclosure in Chiang the reaction mechanism disclosed therein is not driven primarily by thermal energy as recited in claim 1. Accordingly, Applicants respectfully request allowance of claim 1 and its dependents.

With respect to claim 2, the Office Action states Sherman teaches the step of converting oxygen into silica glass by introducing atomic constituents that have an average atomic mass equal to or less than that of oxygen. Applicants noted, however, that claim 2 requires "biasing the substrate to promote a sputtering effect during the converting step" and that Sherman does not teach or suggest such biasing. The previous rejection attempted to make up for this deficiency in Sherman by relying on Chiang to teach the biasing limitation. During the interview Applicants noted, however, that a person of skill in the art would appreciate that when the teaching of Chiang et al. is applied to deposition of a silica glass film, the converting step would include (i) an oxygen-containing source as the "second reactant" since oxygen is required to convert silicon into silica glass along with (ii) an appropriate ion feed gas that drives the deposition process according to the ion imparted kinetic energy technique taught by Chiang. As previously mentioned and as discussed in the interview, Chiang et al. biases the substrate in order to effect an ion-induced reaction mechanism at the substrate's surface by using a relatively heavy inert gas such as Ar, Kr, Ne and Xe (col. 7, lines 5-7). The combination of an oxygen source and one of the ion feed gases described in Chiang result in the constituents introduced into the chamber during the converting step that necessarily have an average atomic mass greater

than oxygen. Accordingly, it is clear that the combination of Sherman and Chiang et al. does not result in the invention of claim 2 which requires that the average atomic mass of all constituents introduced into the chamber during the converting step be less than or equal to the average atomic mass of oxygen.

Claim 15 includes a limitation of "converting the silicon-containing reactant into a silica glass insulating compound by exposing the substrate to a plasma formed from a second reactant comprising oxygen atoms while biasing the substrate to promote a sputtering effect, wherein an average atomic mass of all atomic constituents introduced into the chamber during the converting step is less than or equal to an average atomic mass of oxygen" and is thus believed to be patentable over the applied references for reasons similar to those just discussed with respect to claim 2.

Independent Claim 29

Applicants and the Examiner did not discuss independent claim 29 during the interview. Claim 29 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Chiang et al., U.S. Patent No. 6,428,859 in view of Sherman U.S. Patent No. 6,342,277, Chiang et al., U.S. Publication No. 2002/0197402 and Machida et al., U.S. Patent No. 4,732,761. This rejection is traversed.

Various portions of the rejection of claim 29 are set forth among various portions of the Office Action spanning pages 3-9. In a paragraph spanning page 3, all of page 4 and the first two lines of page 5, the Office Action discuss discusses differences between the Chiang reference and the claims including claim 29. Prior to this paragraph, however, there was no comparison of Chiang to claim 29 and thus Applicants are unsure of how the Office Action is using the Chiang reference with respect to claim 29. The Office Action then goes on to fill in the deficiencies of Chiang with the teachings of Sherman (page 8, lines 6-8) and Machida (page 8, line 15 to page 9, line 3). Both the Chiang and Sherman references describe various ALD (atomic layer deposition) techniques. In contrast, the Machida reference pertains to a standard CVD process that is not ALD technology. It is unclear how the film deposition techniques in Machida can be combined with the ALD techniques of either Chiang or Sherman to grow a silica

film at a rate greater from the bottom than the sidewalls as set forth in the Office Action. These references are directed to non-analogous art. For at least this reason, Applicants respectfully assert that a *prima facia* case of obviousness has not been established for claim 29 and that the rejection of claim 29 be withdrawn. If the Examiner disagrees, Applicants respectfully request that specific details of the rejection of claim 29 be set forth in the next Office Action including a clear description of how each reference is applied to the claim, as well as an explanation as to how CVD technology can be properly combined with ALD technology.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

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